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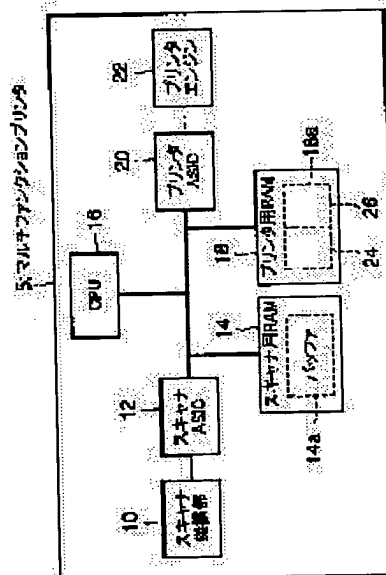
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## (54) MULTIFUNCTION PRINTER AND ITS CONTROLLING METHOD

(57)Abstract:

**PROBLEM TO BE SOLVED:** To shorten print waiting time as much as possible in high resolution printing.  
**SOLUTION:** Even bits of data scanned at a scanner mechanism section 10 are stored in an even interlace memory 24 and odd bits of scan data are stored in an odd interlace memory 26. Since an interlace processing task 42 is simply required to read out scan data of even bits from the even interlace memory 24 and odd bits of scan data from the odd interlace memory 26 at the time of generating print image data, interlace processing can be carried out quickly.



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## CLAIMS

[Claim(s)]

[Claim 1] The multifunction printer which is characterized by providing the following and by which the scanner and the printer were unified. The 1st data storage section for storing the scanning data read with the aforementioned scanner. Based on the scanning data stored in the aforementioned 1st data storage section, the printing image data which is the data format suitable for printing processing is generated. Moving the print head of the aforementioned printer based on this printing image data. The printing statement part which prints with the printing path which drove the aforementioned print head. The data distributing section stored in the aforementioned 1st data storage section after distributing the aforementioned scanning data to the form suitable for generating the aforementioned printing image data, when the aforementioned scanning data are stored in the aforementioned 1st data storage section.

[Claim 2] The multifunction printer according to claim 1 characterized by what is printed with the printing path of multiple times about one line of the aforementioned scanning data since the resolution of the aforementioned print head is coarser than the resolution which the aforementioned printer should print to print media.

[Claim 3] The aforementioned data distribution section is a multifunction printer according to claim 2 characterized by what the aforementioned scanning data are distributed for according to the aforementioned printing path.

[Claim 4] After the printing path about one line of the aforementioned scanning data is 2 times and the aforementioned data distribution section distributes the aforementioned scanning data to even bits and odd bits, it is the multifunction printer according to claim 2 characterized by what is stored in the aforementioned 1st data storage section.

[Claim 5] The aforementioned data distribution section is a multifunction printer according to claim 1 characterized by having the 2nd data storage section which stores temporarily the scanning data read with the aforementioned scanner, and the distribution statement part stored in the aforementioned 1st data storage section after reading the aforementioned scanning data from the aforementioned 2nd data storage section and performing the aforementioned distribution.

[Claim 6] After dividing into even bits and odd bits, the aforementioned distribution statement part the aforementioned scanning data. The even-bit data of the aforementioned scanning data for every line of the aforementioned scanning data. It stores in the data storage section for even bits of the aforementioned 1st data storage section, the odd-bit data of the aforementioned scanning data. It stores in the data storage section for odd bits of the aforementioned 1st data storage section for every line of the aforementioned scanning data. The aforementioned printing statement part. The multifunction printer according to claim 5 characterized by what is printed after performing interface processing which takes out scanning data at intervals of a line, respectively from the aforementioned data storage section for even bits, and the aforementioned data storage section for odd bits.

[Claim 7] The aforementioned distribution statement part is a multifunction printer according to claim 6 characterized by what it has the latch buffer of a predetermined data length, the aforementioned scanning data of the aforementioned predetermined data length are latched to a

latch buffer, the scanning data stored in the aforementioned data storage section for even bits are acquired from even bits of this latch buffer, and the scanning data stored in the aforementioned data storage section for odd bits are acquired from odd bits of this latch buffer.

[Claim 8] The aforementioned distribution statement part about all the patterns of the scanning data of a predetermined data length. The look-up table for even number in which the even-bit data which extract even bits and are obtained from the scanning data of the aforementioned predetermined data length are stored. The look-up table for odd number in which the odd-bit data which extract odd bits and are obtained from the scanning data of the aforementioned predetermined data length about all the patterns of the scanning data of a predetermined data length are stored. The aforementioned scanning data are read [aforementioned] from \*\*\*\*\* and the aforementioned 2nd data storage section a predetermined data length every. This read scanner data, while acquiring the scanning data which compare the aforementioned look-up table for even number, and are stored in the aforementioned data storage section for even bits the aforementioned reading appearance — the multifunction printer according to claim 6 characterized by what scanner data are compared with the aforementioned look-up table for odd number the bottom, and the scanning data stored in the aforementioned data storage section for odd bits are acquired for

[Claim 9] The aforementioned printing statement part reads the aforementioned scanning data from either the aforementioned data storage section for even bits, or the aforementioned data storage section for odd bits at intervals of K lines. After performing one printing path and carrying out the ejection of the print sheet by F lines, the aforementioned scanning data are read from another side of the aforementioned data storage section for even bits, and the aforementioned data storage section for odd bits at intervals of K lines. While repeating by turns the processing which performs one printing path and carries out the ejection of the print sheet by F lines about the aforementioned data storage section for odd bits, and the aforementioned data storage section for even bits Above K and Above F are a multifunction printer according to claim 6 characterized by what it has a relatively prime relation for.

[Claim 10] The aforementioned distribution statement part is a multifunction printer according to claim 6 characterized by consisting of hardware.

[Claim 11] It is the multifunction printer according to claim 10 characterized by what the aforementioned interface processing which the aforementioned printing statement part performs is performed for as software processing.

[Claim 12] It is the multifunction printer according to claim 11 characterized by what the aforementioned software processing is performed for by the central processing unit formed only one in common by the aforementioned scanner and the aforementioned printer.

[Claim 13] The aforementioned 1st data storage section and the aforementioned 2nd data storage section are a multifunction printer according to claim 5 characterized by what is prepared as separate memory.

[Claim 14] The multifunction printer which can print the data of the same line of the scanning data which the scanner and printer which are characterized by providing the following were unified, and were read with the aforementioned scanner by the aforementioned printer by the drive to the main scanning direction of X times of the print heads. The distribution storing section stored in the 1st data storage section after distributing so that it may correspond to the data format of each time at the time of dividing the aforementioned scanning data into X drives of the main scanning direction of the print head, and printing them. The printing image-data generation section which generates a printing image data from the aforementioned 1st data storage section based on the scanning data whenever it reads in order the scanning data which were able to be distributed and reads them, and the printing statement part which prints by driving the print head to main scanning direction based on the aforementioned printing image data which the aforementioned printing image-data generation section generated.

[Claim 15] The aforementioned distribution storing section is a multifunction printer according to claim 14 characterized by consisting of hardware.

[Claim 16] The aforementioned printing image generation section is a multifunction printer

according to claim 15 characterized by having in common only one central processing unit which is realized by software processing and performs this software processing by the aforementioned scanner and the aforementioned printer.

[Claim 17] The aforementioned printing image-data generation section is a multifunction printer according to claim 14 characterized by what interface processing which takes out the aforementioned scanning data stored in the aforementioned 1st data storage section for every predetermined line is also performed for.

[Claim 18] It is the multifunction printer according to claim 14 characterized by what the aforementioned distribution storing section reads the aforementioned scanning data from the aforementioned 2nd data storage section while having further the 2nd data storage section which stores temporarily the aforementioned scanning data read with the aforementioned scanner, and the aforementioned distribution is performed for.

[Claim 19] The control method of a multifunction printer characterized by providing the following that the scanner and the printer were unified. The process distributed to the form suitable for generating the printing image data at the time of actually printing the scanning data read with the aforementioned scanner. The process which stores the distributed aforementioned scanning data in the 1st data storage section in the state where it distributed. The process which generates the printing image data which is the data format suitable for printing processing based on the aforementioned scanning data stored in the aforementioned 1st data storage section. The process which prints with the printing path which drove the print head of the aforementioned printer based on the aforementioned printing image data.

[Claim 20] The control method of the multifunction printer which can print the data of the same line of the scanning data which the scanner and printer which are characterized by providing the following were unified, and were read with the aforementioned scanner by the aforementioned printer by the drive to the main scanning direction of X times of the print heads. The process distributed so that it may correspond to the data format of each time at the time of dividing the aforementioned scanning data into X drives of the main scanning direction of the print head, and printing them. The process which stores the distributed aforementioned scanning data in the 1st data storage section. The process which generates a printing image data from the aforementioned 1st data storage section based on the scanning data whenever it reads in order the scanning data which were able to be distributed and reads them. The process which prints by driving the print head to main scanning direction based on the generated aforementioned printing image data.

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] Especially this invention relates to the multifunction printer aiming at shortening of the printing time in copy printing, and its control method about a multifunction printer and its control method.

[0002]

[Description of the Prior Art] A scanner and a printer are unified and the multifunction printer stored in one case is spreading. In such a multifunction printer, it is one set and a role of a scanner, a role of a printer, and a role of a copy machine can be played. In this case, the so-called page printer is used for the printer portion. However, the direction which used serial printers, such as the so-called color ink jet printer, can attain a miniaturization and low-pricing of equipment as a printer.

[0003]

[Problem(s) to be Solved by the Invention] By the way, in case this multifunction printer is used as a copy machine, the scanning data which carried out the scan are temporarily stored with the scanner, and the printing image data is generated based on this stored scanning data. And this printing image data is transmitted to a printer engine, and printing to a print sheet is performed. [0004] However, when using serial printers, such as an ink jet printer, as a printer, the data array between the scanning data which carried out the scan with the scanner, and a printing image data may change with operation of carriage which carried the print head, and combination of an ejection. The typical example is interlace processing.

[0005] Drawing 12 is drawing explaining the concept of this interlace processing. In the example of this drawing 12, the print head of this ink jet printer is equipped with 48 ink regurgitation nozzles, therefore printing for 48 lines can do it by one scan of the print head. Moreover, in this example, it is two scans of the print head and printing for one raster can be performed. That is, #1, #3, --, printing of odd lines that consists of #95 are performed by the scan of the 1st print head, and #2, #4, --, printing of even lines that consists of #96 are performed by the scan of the print head which is the 2nd time.

[0006] In addition, although the example which carries out an ejection by one line and scans the 2nd print head is shown in the example of this drawing 12 after the scan of the 1st print head is completed, after the scan of the 1st print head is completed, an ejection may be carried out by 24 lines (a part for 1/2 raster), and the 2nd print head may be scanned.

[0007] Furthermore, there is infanticide printing as a typical example which becomes an array which is different by scanning data and the printing image data. In this infanticide printing, the scanning data for one line are thinned out at a fixed interval, and high resolution printing is performed. For example, the scanning data for one line are printed by two movements of the print head.

[0008] Drawing 13 is drawing explaining the processing concept which prints the scanning data for one line by two movements of the print head. In this drawing 13, although only the line of #1 is shown, the same is said of lines of #2-#96 other than this.

[0009] First, it prints about even dots of scanning data by horizontal scanning of the 1st print

head. Then, by horizontal scanning of the 2nd print head, it prints about odd dots of scanning data. In printing by horizontal scanning of this 2nd print head, it prints so that odd dots may be located among even dots printed by horizontal scanning of the 1st print head.

[0010] However, processing which generates a printing image data based on scanning data took time, and there was a problem that carriage will stop whenever it carries out carriage movement which carried the print head. For example, when processing which distributes scanning data to even dots and odd dots was performed using software, the processing took considerable time and there was a problem that carriage will stop whenever it carries out carriage movement which carried the print head. That is, carriage movement stopped for every 1 printing path, and there was a problem that carriage could not be continuously operated to right-and-left main scanning direction. For this reason, the performance at the time of printing the scanning data read with the scanner had fallen. This problem was especially generated as a remarkable problem, when the throughput of CPU was not enough.

[0011] Then, this invention is made in view of the aforementioned technical problem, and aims at attaining improvement in the speed of the print speed in the multifunction printer which prints the scanning data read with the scanner using the printing image data of a different data array.

[0012]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the multifunction printer concerning this invention The 1st data storage section for storing the scanning data which are the multifunction printer by which the scanner and the printer were unified, and were read with the aforementioned scanner. Based on the scanning data stored in the aforementioned 1st data storage section, the printing image data which is the data format suitable for printing processing is generated. Moving the print head of the aforementioned printer based on this printing image data The printing statement part which prints with the printing path which drove the aforementioned print head, It is characterized by having the data distribution section stored in the aforementioned 1st data storage section, after distributing the aforementioned scanning data to the form suitable for generating the aforementioned printing image data, when the aforementioned scanning data are stored in the aforementioned 1st data storage section.

[0013] In this case, since the resolution of the aforementioned print head is coarser, it may be made to print with the printing path of multiple times rather than the resolution which the aforementioned printer should print to print media about one line of the aforementioned scanning data.

[0014] Moreover, you may make it the aforementioned data distribution section distribute the aforementioned scanning data according to the aforementioned printing path.

[0015] Furthermore, the printing path about one line of the aforementioned scanning data is 2 times, and you may make it store the aforementioned data distribution section in the aforementioned 1st data storage section, after distributing the aforementioned scanning data to even bits and odd bits.

[0016] You may make it the aforementioned data distribution section equipped with the 2nd data storage section which stores temporarily the scanning data read with the aforementioned scanner, and the distribution statement part stored in the aforementioned 1st data storage section after reading the aforementioned scanning data from the aforementioned 2nd data storage section and performing the aforementioned distribution on the other hand.

[0017] Moreover, after dividing into even bits and odd bits, the aforementioned distribution statement part the aforementioned scanning data The even-bit data of the aforementioned scanning data for every line of the aforementioned scanning data It stores in the data storage section for even bits of the aforementioned 1st data storage section, the odd-bit data of the aforementioned scanning data It stores in the data storage section for odd bits of the aforementioned 1st data storage section for every line of the aforementioned scanning data. the aforementioned printing statement part You may be made to print after performing interface processing which takes out scanning data at intervals of a line, respectively from the aforementioned data storage section for even bits, and the aforementioned data storage section for odd bits.

[0018] Furthermore, the aforementioned distribution statement part is equipped with the latch buffer of a predetermined data length, latches the aforementioned scanning data of the aforementioned predetermined data length to a latch buffer, and acquires the scanning data stored in the aforementioned data storage section for even bits from even bits of this latch buffer, and you may make it acquire the scanning data stored in the aforementioned data storage section for odd bits from odd bits of this latch buffer.

[0019] On the other hand, the aforementioned distribution statement part about all the patterns of the scanning data of a predetermined data length. The look-up table for even number in which the even-bit data which extract even bits and are obtained from the scanning data of the aforementioned predetermined data length are stored. The look-up table for odd number in which the odd-bit data which extract odd bits and are obtained from the scanning data of the aforementioned predetermined data length about all the patterns of the scanning data of a predetermined data length are stored. The aforementioned scanning data are read [aforementioned] from \*\*\*\*\* and the aforementioned 2nd data storage section a predetermined data length every. This read scanner data. While acquiring the scanning data which compare the aforementioned look-up table for even number, and are stored in the aforementioned data storage section for even bits the scanner data which carried out [aforementioned] reading appearance are compared with the aforementioned look-up table for odd number, and you may make it acquire the scanning data stored in the aforementioned data storage section for odd bits

[0020] On the other hand, the aforementioned printing statement part reads the aforementioned scanning data from either the aforementioned data storage section for even bits, or the aforementioned data storage section for odd bits at intervals of K lines. After performing one printing path and carrying out the ejection of the print sheet by F lines, the aforementioned scanning data are read from another side of the aforementioned data storage section for even bits, and the aforementioned data storage section for odd bits at intervals of K lines. One printing path is performed, and while repeating by turns the processing which carries out the ejection of the print sheet by F lines about the aforementioned data storage section for odd bits, and the aforementioned data storage section for even bits, you may make it Above K and Above F have a relatively prime relation.

[0021] Furthermore, the aforementioned distribution statement part may be made to consist of hardware. In this case, the aforementioned interface processing which the aforementioned printing statement part performs may be made to be performed as software processing. Moreover, the aforementioned software processing may be made to be performed by the central processing unit formed only one in common by the aforementioned scanner and the aforementioned printer.

[0022] You may make it prepared on the other hand as memory with separate aforementioned 1st data storage section and aforementioned 2nd data storage section.

[0023] The multifunction printer concerning this invention. The data of the same line of the scanning data which the scanner and the printer were unified and were read with the aforementioned scanner. It is the multifunction printer which can be printed by the aforementioned printer by the drive to the main scanning direction of X times of the print heads. After distributing so that it may correspond to the data format of each time at the time of dividing the aforementioned scanning data into X drives of the main scanning direction of the print head, and printing them. The scanning data which were able to be distributed are read from the distribution storing section stored in the 1st data storage section, and the aforementioned 1st data storage section in order. The printing image-data generation section which generates a printing image data based on the scanning data whenever it reads. It is characterized by having the printing statement part which prints by driving the print head to main scanning direction based on the aforementioned printing image data which the aforementioned printing image-data generation section generated.

[0024] In this case, the aforementioned distribution storing section may be made to consist of hardware.

[0025] Moreover, software processing realizes and you may make it the aforementioned printing

image generation section equipped only with one central processing unit which performs this software processing in common by the aforementioned scanner and the aforementioned printer. [0026] Moreover, the aforementioned printing image-data generation section may be made to perform interface processing which takes out the aforementioned scanning data stored in the aforementioned 1st data storage section for every predetermined line.

[0027] While having further the 2nd data storage section which, on the other hand, stores temporarily the aforementioned scanning data read with the aforementioned scanner, the aforementioned distribution storing section reads the aforementioned scanning data from the aforementioned 2nd data storage section, and may be made to perform the aforementioned distribution.

[0028] The control method of the multifunction printer concerning this invention. It is the control method of a multifunction printer that the scanner and the printer were unified. The process distributed to the form suitable for generating the printing image data at the time of actually printing the scanning data read with the aforementioned scanner. The process which stores the distributed aforementioned scanning data in the 1st data storage section in the state where it distributed. The process which generates the printing image data which is the data format suitable for printing processing based on the aforementioned scanning data stored in the aforementioned 1st data storage section. It is characterized by having the process which prints with the printing path which drove the print head of the aforementioned printer based on the aforementioned printing image data.

[0029] The control method of the multifunction printer concerning this invention. The data of the same line of the scanning data which the scanner and the printer were unified and were read with the aforementioned scanner. It is the control method of the multifunction printer which can be printed by the aforementioned printer by the drive to the main scanning direction of X times of the print heads. The process distributed so that it may correspond to the data format of each time at the time of dividing the aforementioned scanning data into X drives of the main scanning direction of the print head, and printing them. The process which stores the distributed aforementioned scanning data in the 1st data storage section. The scanning data which were able to be distributed are read from the aforementioned 1st data storage section in order. It is characterized by having the process which generates a printing image data based on the scanning data whenever it reads, and the process which prints by driving the print head to main scanning direction based on the generated aforementioned printing image data.

[0030]

[Embodiments of the Invention] The [1st operation form] The 1st operation form of this invention enables it to generate a printing image data by performing processing which distributes scanning data to even bits and odd bits using ASIC, and classifying and storing beforehand even bits [these] scanning data and odd-bit scanning data in interface memory, even if it does not carry out distribution processing in the case of the interface processing performed as software processing. And it is going to print the scanning data read with the scanner in shortest thereby possible time. \*\*\*\*\* is explained more below.

[0031] First, based on drawing 1, the internal configuration of the multifunction printer 5 concerning this operation gestalt is explained. This drawing 1 is the block diagram showing the internal configuration of the multifunction printer 5 by which the scanner and the printer were unified.

[0032] As shown in drawing 1, the multifunction printer 5 is equipped with the scanner mechanism section 10, a scanner (Application Specific IC) ASIC 12 and the objects RAM (Random Access Memory) 14 and CPU (Central Processing Unit : central processing unit) 16 for scanners, RAM18 for printers, and a printer ASIC 20 and the printer engine 22.

[0033] A scanner ASIC 12, the objects RAM14 and CPU16 for scanners, RAM18 for printers, and the printer ASIC 20 are mutually connected through the internal bus. Interface memory 18a stored until buffer 14a which stores temporarily the scanning data read in the scanner mechanism section 10 in RAM14 for scanners is generated and it carries out interface processing of the scanning data into RAM18 for printers is generated. In this operation form, although RAM14 for scanners and RAM18 for printers are formed separately, these are

summarized and it is good also as one RAM.

[0034] Moreover, interface memory 18a is classified into the interface memory 24 for even number, and the interface memory 26 for odd number in this operation form. Even bits in scanning data are stored in the interface memory 24 for even number, and odd bits in scanning data are stored in the interface memory 26 for odd number. Processing which distributes scanning data to even bits and odd bits is performed by the scanner ASIC 12.

[0035] The scanner mechanism section 10 has the line image sensors which read a manuscript optically. It is possible by carrying these line image sensors in carriage, and moving carriage to an other end side from the end side of a manuscript to read the whole manuscript. The scanner ASIC 12 is controlling this reading operation, and the read scanning data are stored in buffer 14a generated in RAM14 for scanners. When the scanning data of the specified quantity are accumulated at buffer 14a in high resolution printing, the scanning data is transmitted to the interface memory 24 for even number and the interface memory 26 for odd number which were generated in RAM18 for printers, respectively, after being able to distribute to even bits and odd bits.

[0036] The scanning data stored in the interface memory 24 for even number and the interface memory 26 for odd number are transmitted to a printer ASIC 20 as a printing image data, after interface processing is carried out by CPU16. In this operation form, interface processing is first performed to the scanning data stored in the interface memory 24 for even number, a printing image data is generated, and it transmits to a printer ASIC 20 as a printing image data for 1 printing path. For example, based on the scanning data stored in odd lines of the interface memory 24 for even number, the printing image for 1 printing path is generated, and it transmits to a printer ASIC 20. A printer ASIC 20 prints by controlling the printer engine 22 based on the printing image data for this 1 printing path. Specifically, moving the print head to main scanning direction, ink is breathed out from two or more ink \*\*\*\* nozzles in the print head, and printing of even dots is performed to a print sheet.

[0037] Then, CPU16 performs interface processing to the scanning data stored in the interface memory 26 for odd number, generates a printing image data, and transmits it to a printer ASIC 20 as a printing image data of the printing path in the same line as the printing path which printed the point. For example, based on the scanning data stored in odd lines of the interface memory 26 for odd number, the printing image for 1 printing path is generated, and it transmits to a printer ASIC 20. A printer ASIC 20 prints by controlling the printer engine 22 based on a printing image data. Under the present circumstances, it prints so that odd dots printed this time may be located among even dots which printed the point to the print sheet.

[0038] Next, the multifunction printer 5 concerning this operation form carries out an ejection in the direction of vertical scanning (direction which intersects main scanning direction) for a print sheet by one line. And the scanning data stored in even lines of the interface memory 24 for even number are printed similarly, and the scanning data stored in even lines of the interface memory 26 for odd number are printed. Thus, a part for one raster can be printed by performing printing which moved the print head to main scanning direction 4 times.

[0039] With this operation gestalt, after dividing into even bits and odd bits the scanning data which are on one line in this way, while performing even bits printing and odd-bit printing separately, high resolution printing is realized by performing printing of odd lines and even lines individually.

[0040] The multifunction printer 5 concerning this operation gestalt prints by storing in RAM18 for printers of 1 band unit (a part for the height of the print head) at least the scanning data which equipped with and carried out the scan of the memory buffer of a page unit so that the above thing may show.

[0041] Although the content of rough processing of the multifunction printer 5 is as above next, it explains various kinds of tasks with which the multifunction printer 5 is equipped.

[0042] Drawing 2 is drawing showing various kinds of tasks processed by CPU16. In this operation form, only one CPU16 is formed in the multifunction printer 5 as a central processing unit. For this reason, the both sides of the processing of a task about a scanner and processing of the task about a printer will be performed by this CPU16. Moreover, the real-time multitasking

OS (operating system) 30 is used for the multifunction printer 5 of this operation form. For this reason, CPU16 will be assigned to various kinds of tasks by predetermined priority on this real-time multitasking OS 30.

[0043] As shown in drawing 2, the multifunction printer 5 in this operation form is equipped with the printing executive operation task 40, the scanner processing task 41, the interface processing task 42, and the idle task 43. Moreover, it has various tasks besides this as other tasks 44.

[0044] Although the detailed contents of processing of each task are mentioned later, the scanner processing task 41 is a task for performing the scanning and processing mentioned above. The interface processing task 42 is a task which reads scanning data from the interface memory 24 for even number, and the interface memory 26 for odd number, and performs interface processing. The printing executive operation task 40 is a task which prints based on the printing image data by which interface processing was carried out.

[0045] Drawing 3 is drawing showing the flow chart explaining the contents of the scanner processing which the scanner processing task 41 concerning this operation form performs. The scanner processing shown in this drawing 3 is processing started by the transfer request transmitted from the interface processing task 42. That is, a transfer request serves as a trigger and the scanner processing task 41 is started. On the occasion of this transfer request, the number of lines which requires scanning data is also specified. For example, specification of the purport which needs the scanning data for ten lines is made.

[0046] As shown in drawing 3, the scanner processing task 41 starts the motor for carriage movement of the scanner mechanism section 10 (Step S10). And a scanner ASIC 12 is ordered the start of a scan (Step S11). A scanner ASIC 12 performs concrete control of scanning operation. For this reason, in the scanner processing task 41, CPU16 is released, after directing the start of a scan on a scanner ASIC 12.

[0047] A scanner ASIC 12 performs scanning operation for the specified line, and stores the read scanning data in buffer 14a. For example, when the scanning directions for ten lines are received, the scanning data for ten lines are stored in buffer 14a.

[0048] Then, a scanner ASIC 12 classifies into even bits and odd bits the scanning data stored in buffer 14a, transmits even-bit scanning data to the interface memory 24 for even number, and transmits odd-bit scanning data to the interface memory 26 for odd number. And after finishing all the scanning data transfers stored in buffer 14a, a scanner ASIC 12 generates interruption of a scanning end.

[0049] The scanner processing task 41 is rebooted based on interruption of this scanning end. And as shown in drawing 3, the notice of the completion of a transfer which shows that the transfer completed the scanner processing task 41 is transmitted to the interface processing task 42 (Step S12). Thereby, scanner processing is completed.

[0050] Next, based on drawing 4 and drawing 5, the distribution processing of the above-mentioned scanning data performed with a scanner ASIC 12 is explained in detail. This drawing 4 is a flow chart explaining the contents of the distribution processing performed with a scanner ASIC 12. Drawing 5 is drawing showing an example of the hardware composition prepared in the scanner ASIC 12, in order to realize the distribution processing.

[0051] As shown in these drawing 4 and drawing 5, when the scanning data of the specified quantity are stored in buffer 14a, a scanner ASIC 12 latches scanning data from buffer 14a, and stores them in the latch buffer 50 (Step S20). In this operation form, this latch is performed per 16 bits (WORD unit). However, the data lengths to latch may be a 8-bit unit (byte unit), a 32-bit unit (long word unit), etc.

[0052] Next, bit  $2n$  ( $n=0-7$ ) scanning data are transmitted to the interface memory 24 for even number, and the scanning data of bit  $2n+1$  ( $n=0-7$ ) are transmitted to the interface memory 26 for odd number (Step S21). Thereby, the scanning data of bits 0, 2, 4, 6, 8, 10, 12, and 14 are stored in the interface memory 24 for even number, and the scanning data of bits 1, 3, 5, 7, 9, 11, 13, and 15 are stored in the interface memory 26 for odd number.

[0053] Next, the storing place address of the interface memory 24 for even number and the storing place address of the interface memory 26 for odd number are updated, respectively (Step

S22). By updating the storing place address, the address which should store the following scanning data will become settled.  
 [0054] Next, it judges whether all the scanning data stored in buffer 14a were transmitted to the interface memory 24 for even number, and the interface memory 26 for odd number (Step S23). When all scanning data finish being transmitted (Step S23: Yes), this distribution processing is completed. As mentioned above, a scanner ASIC 12 generates interruption of a scanning end in this case. On the other hand, in having finished transmitting all scanning data (Step S23: No), it repeats the processing from Step S20 mentioned above.

[0055] Next, based on drawing 6 and drawing 7, the contents of processing of the interface processing task 42 are explained. This drawing 6 is drawing showing the flow chart explaining the contents of the interface expansion processing which the interface processing task 42 concerning this operation form performs. The interface expansion processing shown in this drawing 6 is processing started by the notice of the completion of a transfer transmitted from the scanner processing task 41. That is, the notice of the completion of a transfer serves as a trigger, and the interface processing task 42 is started. Drawing 7 is drawing which explains the processing process which generates a printing image data based on the scanning data stored in the interface memory 24 for even number, and the interface memory 26 for odd number.  
 [0056] As shown in drawing 6, the interface processing task 42 concerning this operation form prints odd dots with the following printing path first — or it determines whether to print even dots (Step S30). Then, it judges whether the interface processing task 42 decided to print odd dots with the following printing path (Step S31). When it is decided that odd dots is printed (Step S31: Yes), the pointer for drawing is set to the interface memory 26 for odd number (Step S32). [0057] odd [ for example, ] stored in the interface memory 26 for odd number in drawing 7 — line #1, #3, —, the case where #95 are printed — the pointer for drawing — odd of the interface memory 26 for odd number — it sets to line #1, #3, —, #95 That is, the print head of the multifunction printer 5 concerning this operation form has 48 ink \*\*\*\* nozzles.

[0058] On the other hand, as shown in drawing 6, when it is judged that even dots is printed at Step S31 (Step S31: No), the pointer for drawing is set to the interface memory 24 for even number (Step S33).  
 [0059] odd [ for example, ] stored in the interface memory 24 for even number in drawing 7 — line #1, #3, —, the case where #95 are printed — the pointer for drawing — odd of the interface memory 24 for even number — it sets to line #1, #3, —, #95

[0060] Next, as shown in drawing 6, the interface processing task 42 acquires scanning data from the pointer for drawing, and generates a printing image data (Step S34). In this operation form, as shown in drawing 7, 48 lines which consists of PD1-PD48 generate the printing image data for one printing path. PD1-PD48 correspond to the ink \*\*\*\* nozzles 1-48 of the print head, respectively.

[0061] Next, as shown in drawing 6, the interface processing task 42 transmits the generated printing image data to the printing executive operation task 40 (Step S35). Thereby, printing which moved the print head to main scanning direction once is performed. Then, a page management counter is updated (Step S36). This page management counter is a counter for judging whether the printing image data for 1 page was generated.

[0062] Then, it judges whether based on this page management counter, the interface processing for 1 page ended the interface processing task 42 (Step S37). When the interface processing for 1 page is completed (Step S37: Yes), this interface expansion processing is ended.  
 [0063] On the other hand, when the interface processing for 1 page is not completed (Step S37: No), it judges whether scanning data required to perform the next interface processing to interface memory 18a are stored (Step S38).  
 [0064] When scanning data required to perform the next interface processing judge that it is stored in interface memory 18a (Step S38: Yes), the processing from Step S30 mentioned above is repeated.  
 [0065] When it is judged that scanning data required to perform the next interface processing are not stored in interface memory 18a on the other hand (Step S38: No), the following transfer request is transmitted to the scanner processing task 41 (Step S39). And this interface

processing task 42 is ended for a while. In this case, this interface processing task 42 is rebooted by sending the notice of the completion of a transfer from the scanner processing task 41 mentioned above.

[0066] In this operation form, printing of the scanning data for one raster is performed by moving the print head to main scanning direction 4 times so that these drawing 6 and drawing 7 may show. For example, odd lines of the interface memory 24 for even number are printed by movement of the 1st print head, odd lines of the interface memory 26 for odd number are printed by movement of the 2nd print head, even lines of the interface memory 24 for even number are printed by movement of the 3rd print head, and even lines of the interface memory for odd number are printed by movement of the 4th print head.

[0067] Next, based on drawing 8, the contents of processing of the printing executive operation task 40 are explained. This drawing 8 is drawing showing the flow chart explaining the contents of the printing executive operation which the printing executive operation task 40 concerning this operation form performs. The printing executive operation shown in this drawing 8 is processing started by the printing demand transmitted with the printing image data from the interface processing task 42. That is, a printing demand serves as a trigger and the printing executive operation task 40 is started.

[0068] As shown in drawing 8, the printing executive operation task 40 concerning this operation form transmits the printing image data which received with the printing demand to a printer ASIC 20 (Step S40). In this operation form, the printer ASIC 20 is performing control at the time of actually printing to a print sheet based on a printing image data with the printer engine 22. Therefore, the printing executive operation task 40 is ended by transmitting a printing image data to a printer ASIC 20. By the printer ASIC 20, a part for 1 printing path is printed by controlling the printer engine 22 and moving the print head to main scanning direction once based on this printing image data.

[0069] Since even bits of scanning data and odd bits were distributed and stored in the interface memory 24 for even number, and the interface memory 26 for odd number, respectively, it becomes unnecessary as mentioned above, to distribute scanning data to even bits and odd bits by the interface processing task 42 according to the multifunction printer 5 concerning this operation form. For this reason, even if it is high resolution printing, it can print by the maximum throughput of the printer engine 22. That is, the scanning data read in the scanner mechanism section 10 can be printed, without stopping horizontal scanning of the carriage which carried the print head of a printer.

[0070] And in this operation form, since [ the processing which distributes scanning data to even bits and odd bits ] it carries out with a scanner ASIC 12, i.e., hardware, even if it is the multifunction printer 5 by which only one is equipped with CPU16, distribution processing can be carried out at high speed. Especially, even if it is the case which is not enough, printing time shorter than before is realizable.

[0071] The [2nd operation form] The 2nd operation form of this invention adds deformation to the distribution processing performed with the scanner ASIC 12 in the 1st operation form mentioned above.

[0072] Drawing 9 is a flow chart explaining the contents of the distribution processing concerning this operation form. Drawing 10 and drawing 11 are drawings showing the look-up table TB 0 for even number used by distribution processing of drawing 9, and the look-up table TB 1 for odd number, respectively.

[0073] First, based on drawing 10 and drawing 11, the composition of the look-up table TB 0 for even number and the look-up table TB 1 for odd number is explained. As shown in drawing 10, the 4-bit even-bit data corresponding to all the patterns of 8-bit scanning data are stored in the look-up table TB 0 for even number. That is, the 4-bit data which extract even bits and are obtained about all 256 patterns that may be generated with 8-bit scanning data are stored beforehand. And when 8-bit scanning data are acquired, even-bit data are obtained by searching this look-up table TB 0 for even number. This is the same also about the look-up table TB 1 for odd number shown in drawing 11. In this operation form, the look-up table TB 0 for these even number and the look-up table TB 1 for odd number are formed in the scanner ASIC 12.



[0074] Next, based on drawing 9, the distribution processing performed with a scanner ASIC 12 is explained. As shown in this drawing 9, when the scanning data of the specified quantity are stored in buffer 14a, a scanner ASIC 12 latches scanning data from buffer 14a, and stores them in the latch buffer 50 (Step S50). In this operation form, this latch is performed per 8 bits (byte unit). However, the data lengths to latch may be a 16-bit unit (WORD unit), a 32-bit unit (long word unit), etc. In this case, according to the data length to latch, it is necessary to form the look-up table TB 0 for even number, and the look-up table TB 1 for odd number in 16 bits or 32 bits.

[0075] Next, with reference to the look-up table TB 0 for even number, the even-bit data corresponding to the scanning data latched at Step S50 are acquired, and this even-bit data is transmitted to the interface memory 24 for even number (Step S51). That is, with reference to the look-up table TB 0 for even number shown in drawing 10, the even-bit data which extracted even bits are acquired from 8-bit scanning data. For example, at Step S50, as scanning data, when "00110100" is latched, based on the look-up table TB 0 for even number, "0110" is acquired as even-bit data. And this even-bit data is transmitted to the interface memory 24 for even number.

[0076] Similarly, as shown in drawing 9, next, with reference to the look-up table TB 1 for odd number, the odd-bit data corresponding to the scanning data latched at Step S50 are acquired, and this odd-bit data is transmitted to the interface memory 26 for odd number (Step S52). That is, with reference to the look-up table TB 1 for odd number shown in drawing 11, the odd-bit data which extracted odd bits are acquired from 8-bit scanning data. For example, like the above, at Step S50, as scanning data, when "00110100" is latched, based on the look-up table TB 1 for odd number, "0100" is acquired as odd-bit data. And this odd-bit data is transmitted to the interface memory 26 for odd number.

[0077] Next, the storing place address of the interface memory 24 for even number and the storing place address of the interface memory 26 for odd number are updated, respectively (Step S53). By updating the storing place address, the address which should store the following scanning data will become settled.

[0078] Next, it judges whether all the scanning data stored in buffer 14a were transmitted to the interface memory 24 for even number, and the interface memory 26 for odd number (Step S54). When all scanning data finish being transmitted (Step S54: Yes), this distribution processing is completed. On the other hand, in having finished transmitting all scanning data (Step S54: No), it repeats the processing from Step S20 mentioned above.

[0079] Since even bits of scanning data and odd bits were distributed and stored in the interface memory 24 for even number, and the interface memory 26 for odd number, respectively by the multifunction printer 5 concerning this operation form as well as the 1st operation form mentioned above, it becomes unnecessary as mentioned above, to distribute scanning data to even bits and odd bits in the interface processing task 42. For this reason, even if it is high resolution printing, it can print by the maximum throughput of the printer engine 22. The scanning data read in the scanner mechanism section 10 can be printed without stopping carriage movement of a printer. That is, the scanning data read in the scanner mechanism section 10 can be printed, without stopping horizontal scanning of the carriage which carried the print head of a printer.

[0080] Moreover, also in this operation gestalt, since [ the processing which distributes scanning data to even bits and odd bits ] it carries out with a scanner ASIC 12, i.e., hardware, even if it is the multifunction printer 5 by which only one is equipped with CPU16, it can process at high speed. Especially, even if it is the case which is not enough, printing time shorter than before is realizable.

[0081] the [3rd operation gestalt] — the [ the 1st which mentioned above the 3rd operation gestalt of this invention, and ] — in 2 operation gestalten, deformation is added to an interface processing method

[0082] Drawing 14 is drawing explaining the technique of highly minute printing in this operation form. As shown in this drawing 14, while dividing into even dots and odd dots the scanning data for one line read in the scanner mechanism section 10 and printing them in this operation form,

interface processing of three lines is performed in the interlace processing task 42. Furthermore, after four dots which adjoin in the shape of a rectangle in the printed print sheet move the print head to main scanning direction once so that it may be printed with a different ink \*\*\*\* nozzle, it is made to carry out the ejection of the print sheet by two lines in the direction of vertical scanning.

[0083] That is, in the example of this drawing 14, the print head has four ink regurgitation nozzles from No. 0 to No. 3. Moreover, even dots is expressed with the round mark and the rhombus mark expresses odd dots in drawing 14.

[0084] By movement to the main scanning direction of the 1st print head, even dots of the line of #2 are printed with a No. 3 nozzle, and the ejection for two lines is carried out. By movement of the main scanning direction of the 2nd print head, odd dots of the line of #1 and #4 are printed with a No. 2 nozzle and a No. 3 nozzle, and the ejection for two lines is carried out. By movement of the main scanning direction of the 3rd print head, even dots of the line of #3 and #6 are printed with a No. 2 nozzle and a No. 3 nozzle, and the ejection for two lines is carried out. By movement of the main scanning direction of the 4th print head, odd dots of the line of #2, #5, and #8 are printed with a No. 1 nozzle, a No. 2 nozzle, and a No. 3 nozzle, and the ejection for two lines is carried out. By movement of the main scanning direction of the 5th print head, even dots of the line of #1, #4, #7, and #10 are printed with the nozzle of — of No. 1 No. 4. [0085] Hereafter, in this way, the processing which prints even dots and odd dots by turns is repeated, and scanning data are printed every three lines. However, the effective printing range which can be normally printed to a print sheet becomes the direction bottom of vertical scanning from the position of the No. 0 nozzle in movement of the 1st print head from the 9th line, as shown in drawing 14.

[0086] Moreover, if the interval of the line of the scanning data to extract is set to K (the example of drawing 14: 3) and the number of lines of an ejection is set to F (the example of drawing 14: 2) in order to print, K and F are a relatively prime relation. By maintaining this relation, as a dotted line shows to drawing 14, four dots which adjoin in the shape of a rectangle come to be printed with a mutually different ink \*\*\*\* nozzle.

[0087] The hardware composition of the multifunction printer 5 concerning this operation form is the same as that of drawing 1, the [ moreover, / the 1st operation form or ] — as 2 operation forms explained, scanning data are classified into even bits and odd bits with a scanner ASIC 12, and the same is said of being stored in the interface memory 24 for even number, and the interface memory 26 for odd number respectively. However, the contents of the interface processing task 42 which CPU16 performs differ.

[0088] Drawing 15 is a flow chart explaining the contents of processing of the interface processing task 42 concerning this operation form. As shown in this drawing 15, in this operation form, the dummy line TDL for a printing start is first formed in the head portion of the interface memory 24 for even number, and the interface memory 26 for odd number (Step S29). Drawing 16 is drawing showing the composition of the interface memory 24 for even number, and drawing 17 is drawing showing the composition of the interface memory 26 for odd number. However, for the scanning data of the line which printing ended after securing the capacity for a predetermined line to RAM18 for printers rather than securing the capacity for 1 page to RAM18 for printers by package, the interface memory 24 for these even number and the interface memory 26 for odd number are usage time pettiness \*\*\*\* one by one by canceling. Therefore, drawing 16 and drawing 17 are conceptual explanatory drawings for helping an understanding to the last.

[0089] As shown in this drawing 16, before starting printing of scanning data in the interface processing task 42 concerning this operation form, the dummy line TDL which consists of line #TDL1—line #TDL8 is added to the head of the interface memory 24 for even number. As mentioned above, a relation with the effective printing range adds the dummy line TDL, and eight lines after a printing start are because normal printing cannot be performed. For this reason, the dummy line TDL which wrote in the data which do not carry out \*\*\*\* of ink from an ink \*\*\*\* nozzle, i.e., NULL data, is prepared.

[0090] As shown in drawing 17, before similarly starting printing of scanning data in the interface

obtains a printing result normal to line #n of the last of scanning data.

[0101] Moreover, in the interface memory 26 for odd number shown in drawing 17, whenever one printing path finishes drawing out at intervals of three lines and setting a pointer, it shifts by four lines, and it prints to dummy line #BDL8. It can \*\* that this obtains a printing result normal to line #n of the last of scanning data. Thereby, processing of the interface processing task 42 is completed.

[0102] On the other hand, as shown in drawing 15, when the scanning data for 1 page are not completed (step S37 A:No), it judges whether scanning data required to perform the next interface processing to interface memory 18a are stored (Step S38).

[0103] When scanning data required to perform the next interface processing judge that it is stored in interface memory 18a (Step S38: Yes), the processing from Step S30 mentioned above is repeated.

[0104] When it is judged that scanning data required to perform the next interface processing are not stored in interface memory 18a on the other hand (Step S38: No), the following transfer request is transmitted to the scanner processing task 41 (Step S39). And this interface processing task 42 is ended for a while. In this case, this interface processing task 42 is rebooted from Step S30 by sending the notice of the completion of a transfer from the scanner processing task 41 mentioned above.

[0105] the [ as mentioned above, / the 1st mentioned above also by the multifunction printer 5 concerning this operation gestalt, and ] — since even bits of scanning data and odd bits were distributed and stored in the interface memory 24 for even number, and the interface memory 26 for odd number, respectively, it becomes unnecessary to distribute scanning data to even bits and odd bits by the interface processing task 42 like 2 operation gestalten For this reason, even if it is high resolution printing, it can print by the maximum throughput of the printer engine 22. The scanning data read in the scanner mechanism section 10 can be printed without stopping carriage movement of a printer. That is, the scanning data read in the scanner mechanism section 10 can be printed, without stopping horizontal scanning of the carriage which carried the print head of a printer.

[0106] Moreover, also in this operation form, since [ the processing which distributes scanning data to even bits and odd bits ] it carries out with a scanner ASIC 12 i.e., hardware, even if it is the multifunction printer 5 by which only one is equipped with CPU16, it can process at high speed. Especially, even if it is the case which is not enough, printing time shorter than before is realizable.

[0107] In addition, this invention is not limited to the above-mentioned operation form, but can deform into various For example, in each operation form mentioned above, although the printing image data of 1 dot is generated from 1-bit data, it does not restrict to this. That is, you may make it generate the printing image data of 1 dot based on multiple-value (for example, 00, 01, 10, 11) data, such as 2 etc. bits. In this case, four patterns without a large dot, an inside dot, a small dot, and a dot will exist about one dot.

[0108] Moreover, in each operation form mentioned above, although the case where one line of scanning data was printed with two printing paths was explained, even when [ of 3 times and 4 times — ] printing with a printing path, this invention can be applied for one line of scanning data. In this case, according to this, interface memory 18a is classified into three pieces and four piece —, and a scanner ASIC 12 should just distribute scanning data according to this.

[0109] Furthermore, in each operation form mentioned above, although the multifunction printer 5 is performing interface processing which prints again between the lines and lines which were printed by the print sheet with another line, in this invention, it is not necessarily required [ printer ] for this interface processing. That is, this invention is applicable also about the multifunction printer which does not carry out interface processing.

[0110] Furthermore, in the operation gestalt mentioned above, although distribution processing of scanning data was constituted from a scanner ASIC 12, this may consist of other hardware mechanisms or software mechanisms.

[0111] Furthermore, the structure which carries out high resolution printing is not restricted to the operation form mentioned above. The resolution of the ink \*\*\*\* nozzle of the print head is

processing task 42 concerning this operation gestalt, the dummy line TDL which consists of line #TDL1—line #TDL6 is added to the head of the interface memory 26 for odd number. As mentioned above, a relation with the effective printing range adds the dummy line TDL, and six lines after a printing start are because normal printing cannot be performed. For this reason, the dummy line TDL which wrote in the data which do not carry out the regurgitation of ink from an ink regurgitation nozzle, i.e., NULL data, is prepared. However, it is only 1 time at the time of starting the copy printing to set the dummy line TDL to these interface memory 24 and 26.

[0091] next, as shown in drawing 15, the interface processing task 42 prints odd dots with the following printing path — or it determines whether to print even dots (Step S30). Then, it judges whether the interface processing task 42 decided to print odd dots with the following printing path (Step S31). When it is decided that even dots is printed (Step S31: No), the pointer for drawing is set to the interface memory 24 for even number (step S33A).

[0092] the [ the 1st which mentioned above the method of the set of this drawing pointer, and ] — it differs from 2 operation gestalten That is, as shown in drawing 16, from the head of the interface memory 24 for even number, it draws out every three lines and a pointer is set. That is, it draws out every three lines from dummy line #TDL1, and a pointer is set. However, in case the following drawing pointer is set, it will shift from the drawing pointer set to last time in four lines and the direction of vertical scanning.

[0093] On the other hand, when it is decided that odd dots is printed (Step S31: Yes), the pointer for drawing is set to the interface memory 26 for odd number (step S32A).

[0094] The method of the set of this drawing pointer is the same as that of the case of the interface memory 24 for even number mentioned above. That is, as shown in drawing 17, from the head of the interface memory 26 for odd number, it draws out every three lines and a pointer is set. That is, it draws out every three lines from dummy line #TDL1, and a pointer is set. However, in case the following drawing pointer is set, it will shift from the drawing pointer set to last time in four lines and the direction of vertical scanning.

[0095] Next, as shown in drawing 15, the interface processing task 42 acquires scanning data from the pointer for drawing, and generates a printing image data (Step S34). And the interface processing task 42 transmits the generated printing image data to the printing executive operation task 40 (Step S35). Thereby, printing which moved the print head to main scanning direction once is performed.

[0096] Next, a page management counter is updated (Step S36). This page management counter is a counter for judging whether the printing image data for 1 page was generated.

[0097] Then, it judges whether based on this page management counter, reception of the scanning data for 1 page ended the interface processing task 42 (step S37A). When reception of the scanning data for 1 page is completed (step S37 A:Yes), the dummy line BDL for a printing end is set to the interface memory 24 for even number, and the interface memory 26 for odd number (step S37B).

[0098] In the example of drawing 16, before ending printing of scanning data, the dummy line BDL which consists of line #BDL1—line #BDL8 is added to the tail of the interface memory 24 for even number. As mentioned above, a relation with the effective printing range adds the dummy line BDL, and eight lines in front of a printing end are because normal printing cannot be performed. For this reason, the dummy line TDL which wrote in the data which do not carry out \*\*\*\* of ink from an ink \*\*\*\* nozzle, i.e., NULL data, is prepared.

[0099] As shown in drawing 17, before similarly ending printing of scanning data, the dummy line BDL which consists of line #BDL1—line #BDL6 is added to the tail of the interface memory 26 for odd number. As mentioned above, a relation with the effective printing range adds the dummy line BDL, and six lines in front of a printing end are because normal printing cannot be performed. For this reason, the dummy line TDL which wrote in the data which do not carry out \*\*\*\* of ink from an ink \*\*\*\* nozzle, i.e., NULL data, is prepared.

[0100] Next, as shown in drawing 15, the interface processing task 42 prints to the last of the dummy line BDL (step S37C). That is, in the interface memory 24 for even number shown in drawing 16, whenever one printing path finishes drawing out at intervals of three lines and setting a pointer, it shifts by four lines, and it prints to dummy line #BDL8. It can \*\* that this

data were stored in the data storage section, the processing time taken to generate a printing image data can be shortened.

[Translation done.]

coarser than the resolution on a print sheet, and this invention is applicable if it is the printer of the structure which printing on a print sheet completes with the printing path of multiple times. [0112] Moreover, in the operation form mentioned above, although the case where the processing for generating the print data which can be printed with the printer engine 22 was bit distribution processing for high resolution printing was explained based on scanning data, even when generating the print data which can be printed with the printer engine 22 by performing other processings to scanning data, this invention can be applied. For example, while dividing scanning data into even bits and odd bits with a scanner ASIC 12, you may make it store in RAM18 for printers in the 3rd operation form, after carrying out interface processing which takes out scanning data every three lines, as shown in drawing 18. If it does in this way, scanning data will be stored in RAM18 for printers in order of a printing path. For this reason, in the case of printing, interface processing also becomes unnecessary by CPU16, and the upper shell of every four lines of RAM18 for printers and scanning data are taken out, and it comes to be sufficient if it prints.

[0113] the [ moreover, / the 1st mentioned above as another example, or ] -- in 3 operation forms, this invention is applicable also to the multifunction printer which does not perform processing which extracts even bits and odd bits, but performs only interface processing. You may make it store in RAM18 for printers, after carrying out interface processing which takes out scanning data every three lines in the 3rd operation form in this case. It is sufficient if a multifunction printer will take out scanning data of four lines at a time in order of the upper shell of RAM18 for printers in the case of printing if it does in this way, and it prints. In addition, a scanner ASIC 12 may perform the distribution for the interface processing which takes out scanning data every three lines in this case, and it may be performed by CPU16. [0114] Furthermore, although even bits was printed ahead of odd bits in the same line, this is made reverse and you may make it print odd bits ahead of even bits in the operation form mentioned above.

[0115] Moreover, in the operation form mentioned above, although the case where print media was a print sheet was explained to the example, you may be other print media, such as an OHP sheet.

[0116] Moreover, about each task processing of the printing executive operation task 40 explained with the above-mentioned operation form, the scanner processing task 41, and interface processing task 42 grade, it is possible to record the program for performing each [ these ] processing on record media, such as a floppy (registered trademark) disk, CD-ROM (Compact Disc-Read Only Memory), ROM, and memory card, and to distribute in the form of a record medium. In this case, the operation form mentioned above is realizable by making the record medium with which this program was recorded read into the multifunction printer 5, and performing it.

[0117] Moreover, the multifunction printer 5 may be equipped with other programs, such as an operating system and another application program. In this case, other programs with which the multifunction printer 5 is equipped are utilized, and you may make it record an instruction which calls the program which realizes processing equivalent to the operation form mentioned above out of the program with which the multifunction printer 5 is equipped on a record medium. [0118] Furthermore, such a program can also be distributed as a subcarrier through not a form but the network of a record medium. The program transmitted in the form of a subcarrier in the network top is incorporated by the multifunction printer 5, and the operation gestalt mentioned above by performing this program can be realized.

[0119] Moreover, when recording a program on a record medium, or in case a network top is transmitted as a subcarrier, encryption and compression-izing of a program may be made. In this case, after performing a decryption and extension-izing of the program, it is necessary to perform the multifunction printer 5 which read the program from these record media or the subcarrier.

[0120]

[Effect of the Invention] Since it divides and was made to store according to this invention so that it may be suitable for generating a printing image data as explained above when scanning

## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]  
[Drawing 1] It is the block diagram showing the internal configuration of the multifunction printer concerning 1 operation gestalt of this invention.  
[Drawing 2] It is a block diagram explaining various kinds of tasks with which the multifunction printer of drawing 1 is equipped.  
[Drawing 3] It is a flow chart explaining the content of the scanner processing (scanner processing task) concerning this operation gestalt.  
[Drawing 4] It is a flow chart explaining the content of the distribution processing performed with the scanner ASIC concerning this operation gestalt.  
[Drawing 5] It is drawing showing an example of the hardware composition for realizing distribution processing shown in drawing 4.  
[Drawing 6] It is a flow chart explaining the contents of the interface expansion processing (interface processing task) concerning this operation form.  
[Drawing 7] It is drawing explaining the processing which generates the printing image data by which interface processing was carried out from the interface memory for even number, and the interface memory for odd number.  
[Drawing 8] It is a flow chart explaining the contents of the printing executive operation (printing executive operation task) concerning this operation form.  
[Drawing 9] It is a flow chart explaining the contents of the distribution processing performed with the scanner ASIC concerning the 2nd operation form of this invention.  
[Drawing 10] It is drawing showing an example of the composition of the look-up table for even number used by the distribution processing shown in drawing 9.  
[Drawing 11] It is drawing showing an example of the composition of the look-up table for odd number used by the distribution processing shown in drawing 9.  
[Drawing 12] It is drawing for explaining the processing concept of interface processing.  
[Drawing 13] It is drawing explaining the case where even dots and odd dots are printed with two printing paths by high resolution printing.  
[Drawing 14] It is a conceptual diagram explaining the technique of highly minute printing concerning the 3rd operation form of this invention.  
[Drawing 15] It is a flow chart explaining the content of the interface expansion processing (interface processing task) concerning the 3rd operation gestalt of this invention.  
[Drawing 16] It is drawing explaining the composition of the scanning data formed in the interface memory for even number concerning the 3rd operation gestalt.  
[Drawing 17] It is drawing explaining the composition of the scanning data formed in the interface memory for odd number concerning the 3rd operation gestalt.  
[Drawing 18] It is drawing explaining the example of a changed completely type in the 3rd operation gestalt of this invention.  
[Description of Notations]  
5 Multifunction Printer  
10 Scanner Mechanism Section  
12 Scanner ASIC

14 RAM for Scanners  
14a Buffer  
16 CPU  
18 RAM for Printers  
18a Interface memory  
20 Printer ASIC  
22 Printer Engine  
24 Interface Memory for Even Number  
26 Interface Memory for Odd Number  
30 Real-time Multitasking OS  
40 Printing Executive Operation Task  
41 Scanner Processing Task  
42 Interface Processing Task  
43 Idle Task  
44 Other Processing Tasks

[Translation done.]

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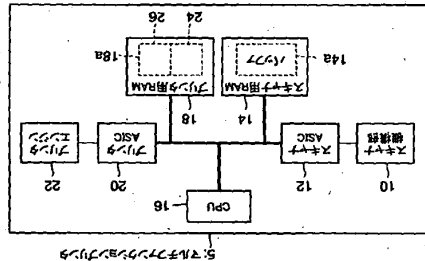
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(33) 優先権主張国	日本 (J P)		

## (54) 【発明の名称】 マルチファンクションプリンタ、及び、その制御方法

## (57) 【要約】

【課題】 高解像度印刷における印刷待ち時間を可及的に短くする。

【解決手段】 スキャナ機構部10でスキャンしたスキヤンデータの偶数ビットを、偶数用インターレースメモリ24に格納し、スキヤンデータの奇数ビットを奇数用インターレースメモリ26に格納する。インターレース処理タスク42は、印刷イメージデータを生成するのにあたり、偶数ビットのスキヤンデータを偶数用インターレースメモリ24から読み出し、奇数ビットのスキヤンデータを奇数用インターレースメモリ26から読み出すだけで済むので、インターレース処理を迅速に行うことができる。



## 【特許請求の範囲】

【請求項1】 スキャナとプリンタとが一体化されたマルチファンクションプリンタであって、

前記スキャナで読み取ったスキヤンデータを格納するための、第1データ格納部と、

前記第1データ格納部に格納されているスキヤンデータに基づいて、印刷処理に適したデータ形式である印刷イメージデータを生成して、この印刷イメージデータに基づいて、前記プリンタの印刷ヘッドを移動させながら、前記印刷ヘッドを駆動した印刷パスにより印刷を行う、印刷実行部と、

前記スキヤンデータを前記第1データ格納部に格納する際に、前記印刷イメージデータを生成するのに適した形式に前記スキヤンデータを振り分けられた上で、前記第1データ格納部に格納する、データ振り分け部と、

を備えることを特徴とするマルチファンクションプリンタ。

【請求項2】 前記プリンタが印刷媒体に印刷すべき解像度よりも、前記印刷ヘッドの解像度の方が、粗いため、前記スキヤンデータの1つのラインについて、複数の回の印刷パスにより印刷を行う、ことを特徴とする請求項1に記載のマルチファンクションプリンタ。

【請求項3】 前記データ振り分け部は、前記スキヤンデータを、前記印刷パスに合わせて振り分ける、ことを特徴とする請求項2に記載のマルチファンクションプリンタ。

【請求項4】 前記スキヤンデータの1つのラインについて、印刷パスは2回であり、前記データ振り分け部は、前記スキヤンデータを偶数ビットと奇数ビットに振り分けた上で、前記第1データ格納部に格納する、ことを特徴とする請求項2に記載のマルチファンクションプリンタ。

【請求項5】 前記データ振り分け部は、

前記スキャナで読み取ったスキヤンデータを一時的に格納する第2データ格納部と、

前記第2データ格納部から前記スキヤンデータを読み出して、前記振り分けを行った上で、前記第1データ格納部に格納する、振り分け実行部と、

を備えることを特徴とする請求項1に記載のマルチファンクションプリンタ。

【請求項6】 前記振り分け実行部は、前記スキヤンデータを、偶数ビットと奇数ビットに分けた上で、前記スキヤンデータの偶数ビットのデータを、前記スキヤンデータの各ライン毎に、前記第1データ格納部の偶数ビットのデータに格納し、前記スキヤンデータの奇数ビットのデータを、前記スキヤンデータの各ライン毎に、前記第1データ格納部の奇数ビット用データ格納部に格納し、

前記印刷実行部は、前記偶数ビット用データ格納部と前記奇数ビット用データ格納部から、それぞれ、1ライン

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おきにスキヤンデータを取り出すインターレース処理を行った上で、印刷を行う、ことを特徴とする請求項5に記載のマルチファンクションプリンタ。

【請求項7】 前記振り分け実行部は、所定データ長のラッチバッファを備えており、前記所定データ長の前記スキヤンデータをラッチバッファにラッチし、このラッチバッファの偶数ビットから、前記偶数ビット用データ格納部に格納するスキヤンデータを取得し、このラッチバッファの奇数ビットから、前記奇数ビット用データ格納部に格納するスキヤンデータを取得する、ことを特徴とする請求項6に記載のマルチファンクションプリンタ。

【請求項8】 前記振り分け実行部は、

所定データ長のスキヤンデータのすべてのパターンについて、前記所定データ長のスキヤンデータから偶数ビットを抽出して得られる偶数ビットデータが、格納されている、偶数用ラッチアップデータと、

所定データ長のスキヤンデータのすべてのパターンについて、前記所定データ長のスキヤンデータから奇数ビットを抽出して得られる奇数ビットデータが、格納されている、奇数用ラッチアップデータと、

を備えており、前記第2データ格納部から、前記スキヤンデータを前記所定データ長ずつ読み出し、この読み出したスキヤンデータと、前記偶数用ラッチアップデータとを比較して、前記偶数ビット用データ格納部に格納するスキヤンデータを取得するとともに、前記読み出したスキヤンデータと、前記奇数用ラッチアップデータとを比較して、前記奇数ビット用データ格納部に格納するスキヤンデータを取得する、

ことを特徴とする請求項6に記載のマルチファンクションプリンタ。

【請求項9】 前記印刷実行部は、

前記偶数ビット用データ格納部及び前記奇数ビット用データ格納部の一方からKラインおきに前記スキヤンデータを読み出して、1回の印刷パスを実行し、Kライン分だけ印刷用紙を紙送りした後、

前記偶数ビット用データ格納部及び前記奇数ビット用データ格納部の他方からKラインおきに前記スキヤンデータを読み出して、1回の印刷パスを実行し、Kライン分だけ印刷用紙を紙送りする処理を、

前記奇数ビット用データ格納部と前記偶数ビット用データ格納部について交互に繰り返すとともに、

前記Kと前記Fは互いに素の関係にある、ことを特徴とする請求項6に記載のマルチファンクションプリンタ。

【請求項10】 前記振り分け実行部は、ハードウェアで構成されていることを特徴とする請求項6に記載のマルチファンクションプリンタ。

【請求項11】 前記印刷実行部が行う前記インターレース処理は、ソフトウェアループとして行われる、ことを特徴









キャナ機部10で読み取ったスキヤンデータを印刷することができるようになる。

【0070】しかし、本実施形態においては、スキヤンデータを偶数ビットと奇数ビットとに振り分ける処理を、スキヤナASIC12、つまりハードウェアで行うこととしたので、CPU16を1つしか備えていないマルチファンクションプリンタ5であっても、高速に振り分け処理をすることができ、特に、CPU16の処理速度が十分でない場合であっても、従来より短い印刷時間を実現することができ、

【0071】第2実施形態 本発明の第2実施形態は、上述した第1実施形態におけるスキヤナASIC12で行われる振り分け処理に、変形を加えたものである。

【0072】図9は、本実施形態に係る振り分け処理の内容を説明するフローチャートである。図10及び図11は、図9の振り分け処理で用いられる偶数用ルックアップテーブルTB0と奇数用ルックアップテーブルTB1とをそれぞれ示す図である。

【0073】まず、図10及び図11に基づいて、偶数用ルックアップテーブルTB0と奇数用ルックアップテーブルTB1の構成について説明する。図10に示すように、偶数用ルックアップテーブルTB0には、8ビットの偶数ビットデータのすべてのパターンに対応する4ビットの偶数ビットデータが格納されている。つまり、8ビットの偶数ビットデータにより発生し得る256パターンの偶数ビットデータについて、偶数ビットを抽出し得る4ビットデータを、予め格納しておく。そして、8ビットのスキヤンデータを取得した際には、この偶数用ルックアップテーブルTB0を参照することにより、偶数ビットデータを抽出されるようにしておく。このことは、図11に示す奇数用ルックアップテーブルTB1についても同様である。本実施形態においては、これら偶数用ルックアップテーブルTB0と奇数用ルックアップテーブルTB1は、スキヤナASIC12内に形成されている。

【0074】次に図9に基づいて、スキヤナASIC12で行われる振り分け処理について説明する。この図9に示すように、バックア14aに所定量のスキヤンデータを格納した時点で、スキヤナASIC12は、バックア14aからスキヤンデータをラッチし、ラッチバッファ50に格納する（ステップS50）。本実施形態においては、8ビット単位（バイト単位）でこのラッチを行う。但し、ラッチするデータ長は、16ビット単位（ワード単位）や32ビット単位（ロングワード単位）等であってもよい。この場合、ラッチするデータ長に合わせ、偶数用ルックアップテーブルTB0と奇数用ルックアップテーブルTB1も、16ビットや32ビット用に形成しておく必要がある。

【0075】次に、偶数用ルックアップテーブルTB0を参照して、ステップS50でラッチされたスキヤンデータを、上述した第1実施形態における、図10に示すように、バックア14aに所定量のスキヤンデータを格納した時点で、スキヤナASIC12は、バックア14aからスキヤンデータをラッチし、ラッチバッファ50に格納する（ステップS50）。本実施形態においては、8ビット単位（バイト単位）でこのラッチを行う。但し、ラッチするデータ長は、16ビット単位（ワード単位）や32ビット単位（ロングワード単位）等であってもよい。この場合、ラッチするデータ長に合わせ、偶数用ルックアップテーブルTB0と奇数用ルックアップテーブルTB1も、16ビットや32ビット用に形成しておく必要がある。

【0076】次に、偶数用ルックアップテーブルTB0を参照して、ステップS50でラッチされたスキヤンデータを、上述した第1実施形態における、図10に示すように、バックア14aに所定量のスキヤンデータを格納した時点で、スキヤナASIC12は、バックア14aからスキヤンデータをラッチし、ラッチバッファ50に格納する（ステップS50）。本実施形態においては、8ビット単位（バイト単位）でこのラッチを行う。但し、ラッチするデータ長は、16ビット単位（ワード単位）や32ビット単位（ロングワード単位）等であってもよい。この場合、ラッチするデータ長に合わせ、偶数用ルックアップテーブルTB0と奇数用ルックアップテーブルTB1も、16ビットや32ビット用に形成しておく必要がある。

対に対応する偶数ビットデータを取得し、この偶数ビットデータを偶数用インタレースメモリ24に転送する（ステップS51）。すなわち、図10に示す偶数用ルックアップテーブルTB0を参照し、8ビットの偶数ビットデータを抽出した偶数用インタレースメモリ24から、偶数ビットを抽出した偶数用インタレースメモリ24をラッチした状態、偶数として、【00110100】をラッチした場合、偶数用ルックアップテーブルTB0に基づいて、偶数ビットデータとして【0110】を取得する。そして、この偶数ビットデータを偶数用インタレースメモリ24に転送する。

【0076】同様に、図9に示すように、次に偶数用ルックアップテーブルTB1を参照して、ステップS50でラッチしたスキヤンデータに対応する奇数ビットデータを取得し、この奇数ビットデータを奇数用インタレースメモリ25に転送する（ステップS52）。すなわち、図11に示す奇数用ルックアップテーブルTB1を参照し、8ビットのスキヤンデータから、奇数ビットを抽出した奇数ビットデータを取得する。例えば、上記と同一の【00110100】をラッチした場合、奇数ビットデータとして【1010】をラッチした場合、奇数用ルックアップテーブルTB1に基づいて、奇数ビットデータとして【1010】を取得する。そして、この奇数ビットデータを奇数用インタレースメモリ25に転送する。

【0077】次に、偶数用インタレースメモリ24の格納アドレスと、奇数用インタレースメモリ25の格納アドレスとを、それぞれ、更新する（ステップS53）。格納アドレスを更新することにより、次のスキヤンデータを格納すべきアドレスが定まることとなる。

【0078】次に、バックア14aに格納されているすべてのスキヤンデータを、偶数用インタレースメモリ24及び奇数用インタレースメモリ25に転送したかどうかを判断する（ステップS54）。すべてのスキヤンデータを転送し終えた場合（ステップS54：Yes）には、この振り分け処理が終了する。一方、すべてのスキヤンデータを転送し終えていない場合（ステップS54：No）には、上述したステップS50からの処理を繰り返す。

【0079】以上のようにより、本実施形態に係るマルチファンクションプリンタ5によっても、上述した第1実施形態と同様に、スキヤンデータの偶数ビットと奇数ビットとを、それぞれ、偶数用インタレースメモリ24と奇数用インタレースメモリ25とに振り分けて格納したので、インタレース処理タスク42ではスキヤンデータを偶数ビットと奇数ビットとに振り分ける必要がなくなる。このため、高解像度印刷であっても、プリンタエンジン22の最大スループットで印刷を行うことができ、プリンタのキャリッジ移動を停止させることなく、スキヤン機部10で読み取ったスキヤンデータを印刷

することができるようになる。つまり、プリンタの印刷ヘッドを格納したキャリッジの主進を停止させることなく、スキヤン機部10で読み取ったスキヤンデータを印刷することができるようになる。

【0080】また、本実施形態においても、スキヤンデータを偶数ビットと奇数ビットとに振り分ける処理を、スキヤナASIC12、つまりハードウェアで行うこととしたので、CPU16を1つしか備えていないマルチファンクションプリンタ5であっても、高速に処理することができ、特に、CPU16の処理速度が十分でない場合であっても、従来より短い印刷時間を実現することができ、

【0081】第3実施形態 本発明の第3実施形態は、上述した第1及び第2実施形態において、インタレース処理の仕方に変形を加えたものである。

【0082】図14は、本実施形態における高解像度印刷の手法を説明する図である。この図14に示すように、本実施形態においては、スキヤン機部10で読み取った1ライン分のスキヤンデータを、偶数ドットと奇数ドットに分けて印刷するとともに、インタレース処理タスク42では3ラインのインタレース処理を行う。さらに、印刷された印刷用紙において矩形状に格納される4つのドットが、異なるインク色で印刷される。即ち、主進方向に印刷ヘッドを1回移動した後に、副進方向に印刷用紙を2ラインだけ紙送りするようにしたものである。

【0083】すなわち、この図14の例では、印刷ヘッドは、0番から3番までの4つのインク色吐出ノズルを有している。また、図14では、偶数ドットを主進方向で送り、奇数ドットを副進方向で送り、

【0084】1回目の印刷ヘッドの主進方向への移動により、#2のラインの偶数ドットを3番ノズルで印刷し、2ライン分の紙送りをする。2回目の印刷ヘッドの主進方向への移動により、#1と#4のラインの奇数ドットを2番ノズルと3番ノズルで印刷し、2ライン分の紙送りをする。3回目の印刷ヘッドの主進方向への移動により、#3と#6のラインの偶数ドットを4番ノズルと3番ノズルで印刷し、2ライン分の紙送りをする。4回目の印刷ヘッドの主進方向への移動により、#2と#5と#8のラインの奇数ドットを1番ノズルと2番ノズルと3番ノズルで印刷し、2ライン分の紙送りをする。5回目の印刷ヘッドの主進方向への移動により、#1と#4と#7と#10のラインの偶数ドットを3番ノズルと4番ノズルで印刷する。

【0085】以下、このように、3ライン毎に、偶数ドットと奇数ドットとを交互に印刷する処理を繰り返して、スキヤンデータの印刷を行っていく。但し、印刷用紙に正常に印刷できる有効印刷領域は、図14に示すように、1回目の印刷ヘッドの移動における0番ノズルの位置から9番目のラインより、副進方向1ラインになる。

【0086】また、印刷を行うために抜き出すスキヤンデータのラインの間隔をK（図14の例では3）とし、紙送りのライン数をF（図14の例では2）とすると、KとFは互いに素の関係になっている。この関係を維持することにより、図14に点線で示すように、矩形状に隣接する4つのドットが互いに異なるインク色（CMYK）で印刷されるようになる。

【0087】本実施形態に係るマルチファンクションプリンタ5のハードウェア構成は、図1と同様である。また、第1実施形態では第2実施形態で説明したように、スキヤナASIC12でスキヤンデータが偶数ビットと奇数ビットに区分されて、それぞれ、偶数用インターレースメモリ24と奇数用インターレースメモリ26に格納されるのも同様である。しかし、CPU16が実行するインターレース処理タスク42の内容が異なる。

【0088】図16は本実施形態に係るインターレース処理タスク42の処理内容を説明するフローチャートである。この図16に示すように、本実施形態においては、まず、偶数用インターレースメモリ24と奇数用インターレースメモリ26との先頭部分に、印刷開始用のダミーラインTDLを形成する（ステップS29）。図16は、偶数用インターレースメモリ24の構成を示す図であり、図17は、奇数用インターレースメモリ26の構成を示す図である。但し、これら偶数用インターレースメモリ24及び奇数用インターレースメモリ26は、1ページ分の容量をプリンタ用RAM18に格納するのではなく、所定ライン分の容量をプリンタのRAM18に確保した上で、印刷終了したラインのスキヤンデータは破棄することにより、頻次使い回しがなされる。したがって、図16及び図17は、あくまでも理解を助けるための概念説明図である。

【0089】この図16に示すように、本実施形態に係るインターレース処理タスク42においては、スキヤンデータの印刷を開始する前に、ライン#TDL1～ライン#TDL8からなるダミーラインTDLを偶数用インターレースメモリ24の先頭に付加する。ダミーラインTDLを付加するのは、上述したように有効印刷範囲との関係で、印刷開始後の8ラインは、正常な印刷ができないためである。このため、インク吐出ノズルからインクの吐出をしないデュータ、つまり、NULLデータを書き込んだダミーラインTDLを用意する。

【0090】図17に示すように、本実施形態に係るインターレース処理タスク42においては、スキヤンデータの印刷を開始する前に、ライン#TDL1～ライン#TDL6からなるダミーラインTDLを奇数用インターレースメモリ26の先頭に付加する。ダミーラインTDLを付加するのは、上述したように有効印刷範囲との関係で、印刷開始後の8ラインは、正常な印刷ができないためである。このため、インク吐出ノズルからインクの吐出をしないデュータ、つまり、NULLデータを書き込んだダミーラインTDLを用意する。

【0091】次に、インターレース処理タスク42は、次の印刷パスで奇数ドットを印刷するの、それとも偶数ドットを印刷するの、を決定する（ステップS30）。続いて、インターレース処理タスク42は、次の印刷パスで奇数ドットを印刷すると決めたかどうかを判断する（ステップS31）。偶数ドットを印刷すると決めた場合は（ステップS31：N）、インターレースメモリ24に書き込まれたスキヤンデータを印刷する（ステップS32A）。図16に示すように、偶数用インターレースメモリ24の先頭から、3行おきに引き抜きポインタをセットする。すなわち、ダミーライン#TDL1から3行おきに引き抜きポインタをセットする。但し、次の引き抜きポインタをセットする際には、前回にセットした引き抜きポインタから4ライン分、副走査方向にシフトすることとなる。

【0092】この引き抜きポインタのセットの仕方は、上述した第1及び第2実施形態と異なる。すなわち、図16に示すように、偶数用インターレースメモリ24の先頭から、3行おきに引き抜きポインタをセットする。すなわち、3行おきに引き抜きポインタをセットする。但し、次の引き抜きポインタをセットする際には、前回にセットした引き抜きポインタから4ライン分、副走査方向にシフトすることとなる。

【0093】一方、奇数ドットを印刷すると決めた場合は（ステップS31：Y）、奇数用インターレースメモリ26に引き抜きポインタをセットする（ステップS32A）。図17に示すように、奇数用インターレースメモリ26の先頭から、3行おきに引き抜きポインタをセットする。すなわち、ダミーライン#TDL1から3行おきに引き抜きポインタをセットする。但し、次の引き抜きポインタをセットする際には、前回にセットした引き抜きポインタから4ライン分、副走査方向にシフトすることとなる。

（ステップS37A）。1ページ分のスキヤンデータの受信が終了した場合は（ステップS37A：Y）、インターレースメモリ24と奇数用インターレースメモリ26に、印刷終了用のダミーラインBDLをセットする（ステップS37B）。

【0098】図16の例では、スキヤンデータの印刷を終了する前に、ライン#BDL1～ライン#BDL8からなるダミーラインBDLを偶数用インターレースメモリ24の末尾に付加する。ダミーラインBDLを付加するのは、上述したように有効印刷範囲との関係で、印刷終了直前の8ラインは、正常な印刷ができないためである。このため、インク吐出ノズルからインクの吐出をしないデュータ、つまり、NULLデータを書き込んだダミーラインBDLを用意する。

【0099】図17に示すように、スキヤンデータの印刷を終了する前に、ライン#BDL1～ライン#BDL6からなるダミーラインBDLを奇数用インターレースメモリ26の末尾に付加する。ダミーラインBDLを付加するのは、上述したように有効印刷範囲との関係で、印刷終了直前の6ラインは、正常な印刷できないためである。このため、インク吐出ノズルからインクの吐出をしないデュータ、つまり、NULLデータを書き込んだダミーラインBDLを用意する。

【0100】次に、図15に示すように、インターレース処理タスク42は、ダミーラインBDLの最後まで印刷を行う（ステップS37C）。すなわち、図16に示す偶数用インターレースメモリ24においては、3ラインおきに引き抜きポインタをセットしながら、1回の印刷パスが完了する毎に4ライン分シフトして、ダミーライン#BDL8まで印刷を行う。これにより、スキヤンデータの最後のライン#nまで正常な印刷結果を得ることができる。これにより、インターレース処理タスク42の処理が終了する。

【0101】また、図17に示す奇数用インターレースメモリ26においては、3ラインおきに引き抜きポインタをセットしながら、1回の印刷パスが完了する毎に4ライン分シフトして、ダミーライン#BDL8まで印刷を行う。これにより、スキヤンデータの最後のライン#nまで正常な印刷結果を得ることができる。これにより、インターレース処理タスク42の処理が終了する。

【0102】一方、図15に示すように、1ページ分のスキヤンデータが終了している場合は（ステップS37A：N）、インターレースメモリ18aに、次のインターレース処理を行うのに必要なスキヤンデータが格納されているかどうかを判断する（ステップS38）。

【0103】次のインターレース処理を行うのに必要なスキヤンデータが、インターレースメモリ18aに格納されていると判断した場合は（ステップS38：Y）、次に、上述したステップS30からの処理を繰り返す。

【0104】一方、次のインターレース処理を行うのに必要なスキヤンデータが、インターレースメモリ18aに格納されていないと判断した場合は（ステップS38：N）、次に、上述したステップS30からの処理を繰り返す。

要なスキヤンデータが、インターレースメモリ18aに格納されていないと判断した場合は（ステップS38：N）、次に、上述したステップS30からの処理を繰り返す（ステップS39）。そして、このインターレース処理タスク42をひとまず終了する。この場合、上述したスキヤン処理タスク41から転送完了通知が受信されることにより、このインターレース処理タスク42はステップS30から再起動される。

【0105】以上のように、本実施形態に係るマルチファンクションプリンタ5によっても、上述した第1及び第2実施形態と同様に、スキヤンデータの偶数ビットと奇数ビットとを、それぞれ、偶数用インターレースメモリ24と奇数用インターレースメモリ26に振り分け格納したので、インターレース処理タスク42ではスキヤンデータを偶数ビットと奇数ビットに振り分ける必要がなくなる。このため、高解像度印刷であっても、プリンタエンジン22の最大スループットで印刷を行うことができる。プリンタのキャリッジ移動を停止させることなく、スキヤン機構部10で読み取ったスキヤンデータを印刷することができるようになる。つまり、プリンタの印刷ヘッドを格納したキャリッジの走査を停止させることなく、スキヤン機構部10で読み取ったスキヤンデータを印刷することができるようになる。

【0106】また、本実施形態においても、スキヤンデータを偶数ビットと奇数ビットに振り分ける処理を、スキヤナASIC12、つまりハードウェアで行うこととしたので、CPU16を1つしか備えないマルチファンクションプリンタ5であっても、高速に処理することができる。特に、CPU16の処理速度が十分でない場合であっても、従来より短い印刷時間を実現することができる。

【0107】なお、本発明は上記実施形態に限定されず種々に変形可能である。例えば、上述した各実施形態においては、1ドットの印刷イメージデータを、1ビットのデータから生成することとしたが、これに限るものではない。すなわち、1ドットの印刷イメージデータは、2ビット等（例えば、00、01、10、11）の多値データに基づいて生成するようにしてもよい。この場合、1つのドットについて、大ドット、中ドット、小ドット、ドット無しなどのパターンが存在することになる。

【0108】また、上述した各実施形態においては、スキヤンデータの1つのラインを2回の印刷パスで印刷する場合を説明したが、スキヤンデータの1つのラインを3回、4回の印刷パスで印刷する場合でも、本発明を適用することができる。この場合、これに合せて、インターレースメモリ18aを、3個、4個に区分し、これに合わせてスキヤナASIC12がスキヤンデータを振り分けるようにすればよい。

【0109】さらに、上述した各実施形態においては、

マルチファンクションプリンタ5は印刷用紙に印刷され、ラインとラインとの間を、別のラインで再び印刷するインターレース処理を行っているが、このインターレース処理は本発明において必ずしも必要なものではない。つまり、インターレース処理をしないマルチファンクションプリンタについても、本発明を適用することができ、

【0110】さらに、上述した実施形態においては、スキャンデータの振り分け処理を、スキヤナASIC12で構成したが、これを他のハードウェア機構又はソフトウェア機構で構成してもよい。

【0111】さらに、高解像度印刷をする仕組みは、上述した実施形態に限るものではない。印刷用紙上の解像度よりも印刷ヘッドのインク吐出ノズルの解像度の方が粗く、複数の回の印刷パスで印刷用紙上の印刷が完了する仕組みのプリンタであれば、本発明を適用することができ、

【0112】また、上述した実施形態においては、スキヤンデータに基づいて、プリンタエンジン22で印刷可能な印刷データを生成するための処理が、高解像度印刷のためのビット振り分け処理である場合を説明したが、スキヤンデータに対して他の処理を施すことにより、プリンタエンジン22で印刷可能なデータを生成する場合でも、本発明を適用することができ、例えば、第3実施形態において、図18に示すように、3ライン毎にスキヤンデータを取り出すインターレース処理をした上で、スキヤナASIC12でスキヤンデータを偶数ビットと奇数ビットとに分けるとともに、プリンタ用RAM18に格納するようにしてもよい。このようにすれば、プリンタ用RAM18は、印刷パスの順にスキヤンデータが格納されることとなる。このため、印刷の際には、CPU16では、インターレース処理も不要になり、プリンタ用RAM18の上から4ラインずつ、スキヤンデータを取り出して、印刷を行えばよいことになる。

【0113】また、別例としては、上述した第1乃至第3実施形態において、偶数ビットと奇数ビットとを抜き出す処理を行わず、インターレース処理だけを行うマルチファンクションプリンタに対しても、本発明を適用することができる。この場合、例えば、第3実施形態においては、3ライン毎にスキヤンデータを取り出すインターレース処理をした上で、プリンタ用RAM18に格納するようにしてもよい。このようにすれば、マルチファンクションプリンタは、印刷の際にプリンタ用RAM18の上から順に4ラインずつ、スキヤンデータを取り出して印刷を行えば足りる。なお、この場合、3ライン毎にスキヤンデータを取り出すインターレース処理のために振り分けは、スキヤナASIC12で行ってもよい、CPU16で行ってもよい。

【0114】さらに、上述した実施形態においては、同ラインの中で偶数ビットを奇数ビットよりも先に印刷

するようにしたが、これを逆にして、奇数ビットを偶数ビットよりも先に印刷するようにしてもよい。

【0115】また、上述した実施形態においては、印刷媒体が印刷用紙である場合を例に説明したが、OHPシート等の他の印刷媒体であってもよい。

【0116】また、上述の実施形態で説明した印刷実行処理タスク40、スキヤナ処理タスク41、及び、インタレース処理タスク42等の各タスク処理については、これら各処理を実行するためのプログラムをフロッピー（登録商標）ディスク、CD-ROM（Compact Disc Read Only Memory）、ROM、メモリーカード等の記録媒体に記録して、記録媒体の形で配布することが可能である。この場合、このプログラムが記録された記録媒体をマルチファンクションプリンタ5に読み込ませ、実行させることにより、上述した実施形態を実現することができる。

【0117】また、マルチファンクションプリンタ5は、オペレーティングシステムや別のアプリケーションプログラム等の他のプログラムを備える場合がある。この場合、マルチファンクションプリンタ5の備える他のプログラムを活用し、記録媒体にはそのマルチファンクションプリンタ5が備えるプログラムの中から、上述した実施形態と同様の処理を実現するプログラムを呼び出すような命令を記録するようにしてもよい。

【0118】さらに、このようなプログラムは、記録媒体の形でではなく、ネットワークを通じて搬送波として頒布することも可能である。ネットワーク上を搬送波の形で伝送されたプログラムは、マルチファンクションプリンタ5に取り込まれて、このプログラムを実行することにより上述した実施形態を実現することができる。

【0119】また、記録媒体にプログラムを記録する際、プログラムの符号化や圧縮化がなされている場合がある。この場合には、これら記録媒体や搬送波からプログラムを読み込んだマルチファンクションプリンタ5は、そのプログラムの復号化や伸張化を行った上で、実行する必要がある。

【0120】  
【発明の効果】以上説明したように、本発明によれば、スキヤンデータをデータ格納部に格納する際に、印刷イメージデータを生成するのに適するように分割して格納するようにしたので、印刷イメージデータを生成するのに要する処理時間を短くすることができる。

【図面の簡単な説明】  
【図1】 本発明の一実施形態に係るマルチファンクションプリンタの内部構成を示すブロック図である。

【図2】 図1のマルチファンクションプリンタが備える各種のタスクを説明するブロック図である。

【図3】 本実施形態に係るスキヤナ処理（スキヤナ処理タスク）の内容を説明するフローチャートである。

【図4】 本実施形態に係るスキヤナASICで実行される振り分け処理の内容を説明するフローチャートである。

【図5】 図4に示す振り分け処理を実現するためのハードウェア構成の一例を示す図である。

【図6】 本実施形態に係るインターレース展開処理（インターレース処理タスク）の内容を説明するフローチャートである。

【図7】 偶数用インターレースメモリと奇数用インターレースメモリとから、インターレース処理された印刷イメージデータを生成する処理を説明する図である。

【図8】 本実施形態に係る印刷実行処理（印刷実行処理タスク）の内容を説明するフローチャートである。

【図9】 本発明の第2実施形態に係るスキヤナASICで実行される振り分け処理の内容を説明するフローチャートである。

【図10】 図9に示す振り分け処理で用いられる偶数用ルックアップテーブルの構成の一例を示す図である。

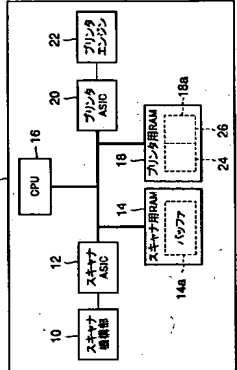
【図11】 図9に示す振り分け処理で用いられる奇数用ルックアップテーブルの構成の一例を示す図である。

【図12】 インタレース処理の処理概念を説明する図である。

【図13】 高解像度印刷で偶数ビットと奇数ビットを2回の印刷パスで印刷する態を説明する図である。

【図14】 本発明の第3実施形態に係る高解像度印刷の手法を説明する概念図である。

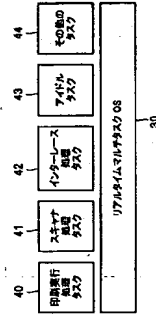
【図15】 本発明の第3実施形態に係るインターレース展開処理（インターレース処理タスク）の内容を説明する



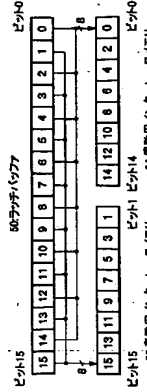
【図1】

5: マルチファンクションプリンタ

【図2】



【図5】



フローチャートである。

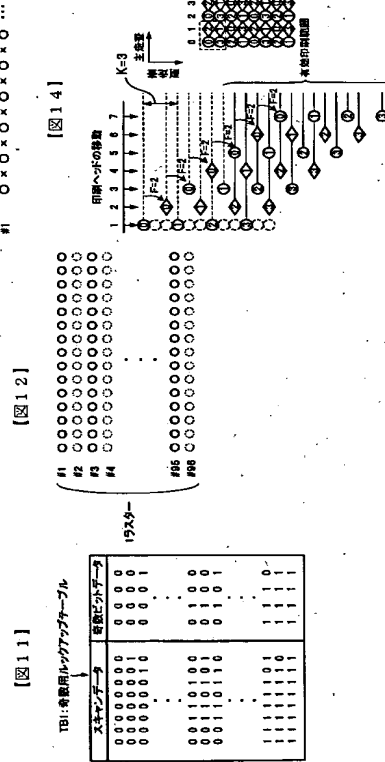
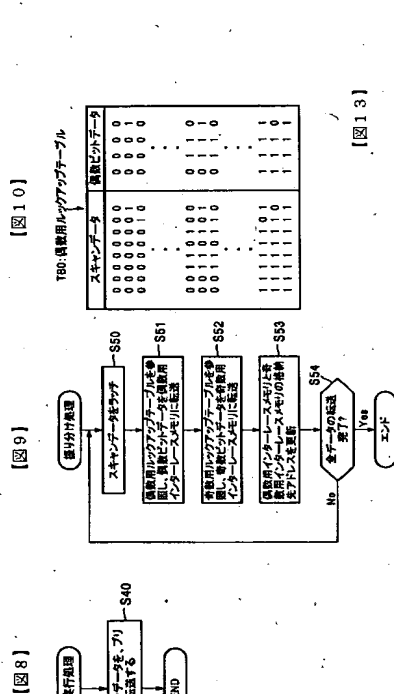
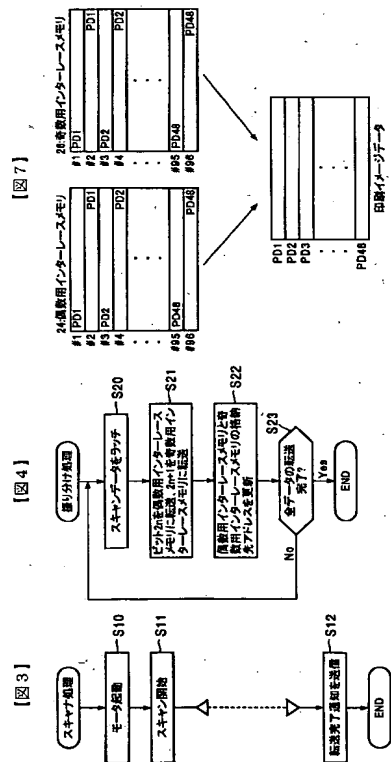
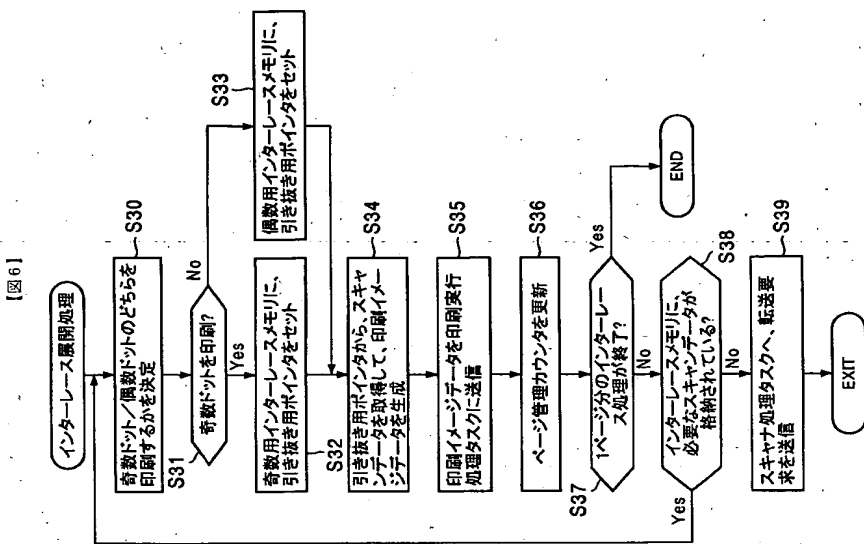
【図16】 第3実施形態に係る偶数用インターレースメモリに形成されるスキヤンデータの構成を説明する図である。

【図17】 第3実施形態に係る奇数用インターレースメモリに形成されるスキヤンデータの構成を説明する図である。

【図18】 本発明の第3実施形態における一変形例を説明する図である。

【符号の説明】

- 5 マルチファンクションプリンタ
- 10 スキヤナ機構部
- 12 スキヤナASIC
- 14 スキヤナ用RAM
- 14a バッファ
- 16 CPU
- 18 プリンタ用RAM
- 18a インタレースメモリ
- 20 プリンタASIC
- 22 プリンタエンジン
- 24 偶数用インターレースメモリ
- 26 奇数用インターレースメモリ
- 30 リアルタイムマルチタスクOS
- 40 印刷実行処理タスク
- 41 スキヤナ処理タスク
- 42 インタレース処理タスク
- 43 アイドルタスク
- 44 その他の処理タスク



(51) Int. Cl. 7  
識別記号

FI  
H04N 1/04

B  
 $\bar{r}$ - $r$   $\bar{r}$ - $r$  (参考)

(51) Int. Cl. 7

107

Fターム(参考) 2C056 EA01 EC12 EC34 EC69 EC74

FA10 HA58.

2C087 BR10 RC02 RC07 CR03 CR13

20001 D519 D002 B001 C000 0218  
20021 A405 A419 B002 D009 0004

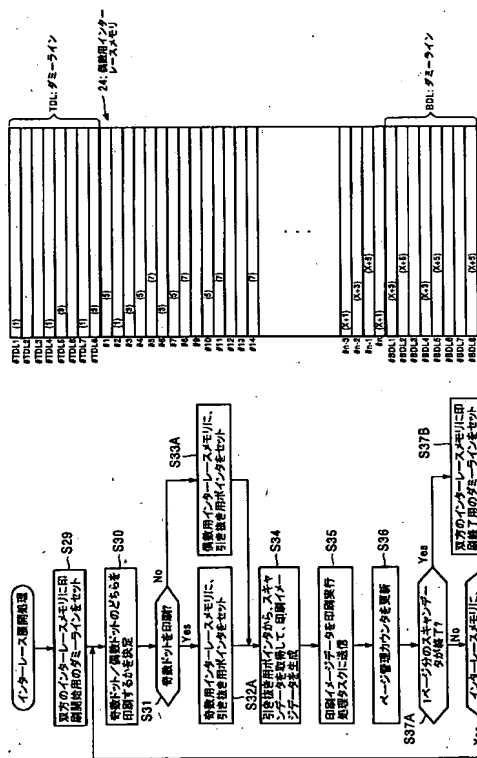
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EC003 1A0E AB17 AB43 AC02 AC22

1994

5C072 AA01 AA03 BA03 EA04 FB21

SA04 UA12 XA01 XA04

**【15】**



【18】

18: プリント用RAM

【☒17】

